

GEMSTONE AND CHEMICALS: HOW TO CREATE COLOR AND INCLUSIONS

By George W. Fischer, Ph.D., 74 pp., illus., publ. by the author, Shelton, WA, 1991. US\$24.00

The bulk of this book is devoted to 35 processes, many with variants, for coloring porous cabochon materials with inorganic substances, some by means of precipitation reactions and some by heating. Included are some well-known "oldies," such as the honey-acid process.

There are many good aspects and some very bad ones to this book. The principal bad one first: While the author gives suitable precautionary warnings and disclaimers about the chemicals he recommends using, the same is not true about the end products. Some of his colored cabochons contain soluble salts of nickel, chromium, cobalt, and so on, which could be dissolved by perspiration to irritate the skin. Don't even think about what would happen if a child were to put one of them in his or her mouth! Anyone who does not know enough chemistry to distinguish the safe from the unsafe among the many processes described by Dr. Fischer should not consider performing any of them.

Yet there are many interesting features in this book. It is well written (except for the occasional awkwardness in phrasing, as in the title), is nicely reproduced from a cleanly typed original (spiral bound with plastic covers), and is illustrated by 16 full-page color plates.

The book, however, contains additional omissions and inconsistencies. Dr. Fischer's knowledge of chemistry appears to be minimal. He gives elaborate details on how to mix hydrochloric acid with water, which needs few precautions. Yet he deals with the very important (both in terms of personal safety and environmental concerns) issue of how to dispose of concentrated sulfuric acid by saying merely to "discard" it.



For him, apparently there are few certainties in even the most basic mineralogy: "Granite is said to be composed of. . . ." Although he apologizes, he also uses improper locality agate names, such as *moabite* and *panautchite*. And he claims that the colors he produces are "natural."

The final and most interesting section contains several ways of forming dendritic copper and tin inclusions in porous agates, which produces very attractive "moss" and "plume" effects. Yet here, too, the soluble salts used are not removed.

Overall, this is an interesting book. In this reviewer's opinion, however, it should not be used by anyone who does not have adequate knowledge of chemistry to evaluate the processes described.

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THE PROPERTIES OF NATURAL AND SYNTHETIC DIAMOND

Edited by John E. Field, 710 pp., illus., publ. by Academic Press, London, England, 1992, US\$195.00*

This imposing textbook is the much-awaited revision of *The Properties of Diamond*, published in 1979 by the same editor (itself the successor of a 1965 book edited by R. Berman). Written at a technical level, it reviews the current knowledge and understanding of diamond's physical properties, growth, and technological applications. The contributing authors are all experts in their respective fields. Although

the book contains few references to gem diamonds, it is a fascinating compilation that includes extensive bibliographic references, and is particularly useful to the research gemologist. Also, this new version is overall more "user friendly" and easier to read than the previous one.

Certainly, interest in diamond as a material has increased considerably since 1979. New methods for the low-pressure synthesis of diamond have already found a number of industrial applications. High-pressure synthesis techniques have also received considerable attention, especially since Sumitomo made its large single-crystal synthetic diamonds commercially available in 1985. This book generally does an excellent job of reporting both old and new knowledge in a single source.

The book has four main sections: Solid State, Geology and Growth, Mechanical, and Industrial. The first section includes chapters on recent advances in theory, absorption and luminescence spectroscopy, nuclear probes (100 pages!), surface properties, diffraction and imaging, aggregation of nitrogen, thermal conductivity, and ion implantation. The geology-and-growth section has chapters on diamond geology, growth of synthetic diamond, and synthesis of diamond from the vapor phase (the only truly new chapter in the book). The mechanical section discusses strength, fracture and erosion properties, indentation hardness, plasticity and creep, friction, and wear and polishing. The industrial section reports on high-technology applications of diamond, as well as on applications of diamond grits and components. The book ends with various property tables.

The change in title, emphasizing the differences between natural and synthetic diamonds, is certainly welcome by gemologists. Particularly recommended for gemologists is the

*This book is available for purchase at the GIA Bookstore, 1660 Stewart Street, Santa Monica, California. Telephone (800) 421-7250, ext. 282.

chapter on absorption and luminescence spectroscopy by C. D. Clark, A. T. Collins, and G. S. Woods (the two latter authors occasionally publish in gemological journals), which contains details useful for the separation both of natural from synthetic diamonds and natural from treated-color diamonds. A. R. Lang, M. Moore, and J. C. Walmsley's chapter on diffraction and imaging contains a wealth of information on microscopic and macroscopic growth features and defects of natural and synthetic diamonds; these are revealed by techniques not generally available to study gems. Diamond geologist extraordinaire Jeff Harris presents new details on the age of diamonds and their formation, and also some data previously presented in the "inclusions in diamonds" chapter, which no longer exists. Gemologists interested in synthetic diamonds grown at high pressure will find the chapter by R. C. Burns and G. J. Davies most informative, with a welcome section on the separation of natural from synthetic crystals. Y. Sato and M. Kamo provide a useful review of the relatively new synthesis of diamond from the vapor phase (also known as CVD diamond, or diamond thin films). Finally, M. Seal provides a short but eye-opening chapter on industrial applications for large gem-quality synthetic diamond crystals.

Given the stated purpose of this book, there are really few criticisms. The fact that the present work is designed to supplement, rather than replace, previous work is sometimes detrimental to clarity. For example, table 18.11, which purportedly lists bands observed in diamonds, does not list such common ones as the N2 and N3 (responsible for the "Cape lines") and the GR (responsible for green color in many instances), since these features were discussed in G. J. Davies' 1977 work. Not only is the convenience of a single reference lost, but Davies' 1977 paper is hard to come by for most gemologists, and even for some scientists.

In conclusion, this work is an authoritative resource on the properties of natural and synthetic diamonds. Although many of the chapters are very technical, with considerable scientific jargon, those of our readers who are curious about the scientific aspects of diamond will find this book a "must have," well worth its hefty price. John Field did a truly remarkable job of condensing and organizing an extremely large body of knowledge.

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OTHER BOOKS RECEIVED

Mineral Reference Manual, by Ernest H. Nickel and Monte C. Nichols, 250 pp., illus., publ. by Van Nostrand Reinhold, New York, 1991. US\$18.95. * Since 1971, when the first edition of Michael Fleischer's *Glossary of Mineral Species* appeared (it is now in its sixth, 1991, edition, with J. A. Mandarino as co-author), the gemological and mineralogical communities have depended on the *Glossary* as the gospel on mineral nomenclature and chemical composition. Now, there is another excellent entry into the field, Nickel and Nichols' *Manual*.

Both books have an alphabetical listing of mineral names, along with chemical formula, crystal system, and color for each of the minerals. Each contains about the same small number of selected well-known chemical varieties (e.g., amazonite, but not rhodolite) and recently discredited minerals. The book under review (the *Manual*) contains up to three references (first description, mineral description, and crystal structure) for each entry compared to a single reference in the *Glossary*. The *Manual* gives some additional physical properties, such as hardness, luster, and density. In addition, it gives the type locality and the "status ruling" of the International Mineralogical Association.

Both books are authored by

experts in the field of mineralogical (but not gemological) nomenclature. Both books are about the same size and (very reasonable) price. The serious gemologist will eventually realize that both are essential references for a good library.

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A Special Report from JPR on the Bold Retro 1940s Jewelry, edited by Nina Woolford, introduction by Lael Hagan, 117 pp., illus., publ. by JPR, Nina Woolford, and Gail Levine, Rockville, VA, 1992, US\$35.00. This informative work incorporates worthwhile information in a deceptively modest-looking paperback. Lael Hagan's short, comprehensive introduction notes the origin of this flamboyant style of jewelry and how certain stylistic concepts can identify a piece as being from the Retro era. The introduction also contains brief but invaluable biographies of obscure as well as well-known designers who were influential during this period.

Although the narrative is a bit wordy for my taste (e.g., "Four hollow, open plaques designed as two puffed yellow gold squares atop each other topped and bottomed with two similar squares beside each other facing out"), it does include valuable data—description of the item, auction house through which it sold, pre-auction estimate, actual sale price, and buyer (dealer, private individual, etc.). Also noted are signs of wear, damage, obvious repair to a piece, metal type and karat content, weight of the piece, size (if applicable), and description of major and accent stones.

The report is plagued with spelling and punctuation errors, but these are minor irritations considering the amount of work involved in compiling so much information.

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